



NOAA National Severe Storms Laboratory

Warn-on-Forecast



When severe weather moves into the area, the public and decision makers rely on National Weather Service forecasters.

National Weather Service watch and warning products are essential to protecting life and property. The accuracy and lead time of such products has increased over the past 40 years but further improvements require a shift from the warn-on-detection framework based mostly on radar observations.

Providing more

A future framework, known as Warn-on-Forecast or WoF, is based on guidance from high-resolution computer models. Researchers at NOAA's National Severe Storms Laboratory are developing WoF to improve forecasts, warnings, and decision support for high-impact thunderstorm events within the watch-to-warning time frame, 0-6 hours in advance of an event.

WoF is designed to provide accurate predictions of thunderstorm hazards—like tornadoes, hail, wind, and flash flooding—to people who need them earlier than is currently possible with detection based techniques. The fundamental concept of WoF is to provide continuous, probabilistic predictions of hazards in individual thunderstorms.

The future

WoF is an important component of FACETs, or Forecasting a Continuum of Environmental Threats. FACETs aims to provide continuous probabilistic hazard information guidance to the public from time frames of multiple weeks through less than one hour. NOAA is using social and behavioral science to evaluate this probabilistic hazard information and how to best communicate this information to the public.

The experimental WoF system guidance was used to test WoF real-forecasting capabilities by operational forecasters on May 2, 2018 in Norman, Oklahoma. Researchers worked directly with forecasters during a severe weather event and this collaboration resulted in forecasters issuing five "Watch-to-Warning" graphics to the public via social media. The graphics proved valuable to the public and forecasters, highlighting the future use for a WoF system. Valuable real-time guidance has also been provided to the National Weather Service's Storm Prediction Center, Weather Prediction Center, and several forecast offices.



The fundamental concept of the Warn-on-Forecast System (WoF) is to provide continuous, probabilistic predictions of hazards in individual thunderstorms. The system is conceptually simple, but scientifically very challenging. Because WoF forecasts can be generated multiple times an hour and need to be transmitted to forecasters as quickly as possible, it pushes the limits of weather prediction models and high performance computing. The forecasts combine high-resolution surface, satellite, and radar data into multiple high-resolution computer models.



In addition to real-time demonstrations, WoF guidance has been tested within NOAA's Hazardous Weather Testbed by researchers, and forecasters as a part of the annual Spring Forecast Experiment for the past three years, as a part of the Hydrometeorological Testbed each summer for the past two years, and presented to emergency managers within the HWT for the first time in spring 2019. The feedback provided by participants guides subsequent improvements to the WoF System as NOAA NSSL collaborates with partners to reduce the billions in economic impacts from severe storms.

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